CLAIMS

WE CLAIM:

1. An energy storage flywheel system containment assembly, comprising:

an outer shield having a mount end, an insertion end, and an inner surface defining a cavity therein;

an intermediate shield disposed within the outer shield cavity, and having a mount end, an insertion end, and an inner surface defining a cavity therein; and

an inner shield disposed within the intermediate shield cavity, and having a mount end, an insertion end, and an inner surface defining a cavity therein, the inner shield cavity having a first end that has a first width and a second end that has a second width that is less than the first width.

2. The containment assembly of Claim 1, wherein the inner shield insertion end includes an opening that extends into the inner shield cavity.

3. The containment assembly of Claim 2, wherein the inner shield mount end includes an opening that extends into the inner shield cavity.

4. The containment assembly of Claim 1, wherein the inner shield cavity second end is substantially collocated with the inner shield insertion end.

5. The containment assembly of Claim 1, wherein at least a portion of the inner shield extends inwardly into the inner shield cavity to form a momentum deflector rim, whereby the inner shield cavity second width is made less than the first width.

6. The containment system of Claim 1, further comprising:

a lid adapted to be coupled to the outer shield insertion end, the lid configured to cover at least a portion of each of the outer shield, intermediate shield, and inner shield insertion ends.

7. The containment assembly of Claim 6, wherein the lid is configured as a lid assembly that comprises:

a containment vessel lid coupled to outer shield insertion end, the containment vessel lid having in inner side facing at least the outer shield, an outer side, and an inner and outer peripheral side surfaces, the inner peripheral side surface defining an access opening through the containment vessel lid; and

an access plate coupled to the containment vessel lid and covering at least the access opening, the access plate having an inner side, an outer side, and an outer peripheral side surface.

8. The containment assembly of Claim 1, wherein:

the outer vessel mount end is configured to be coupled to a mount surface; and

the outer shield insertion end includes an opening that extends into the outer shield cavity.

9. The containment assembly of Claim 1, wherein the intermediate shield is spaced apart from the outer shield to define an intermediate space therebetween.

10. The containment assembly of Claim 9, further comprising:

a vibration damping material disposed within the intermediate space.

11. The containment assembly of Claim 10, wherein the vibration damping material comprises sand.

12. The containment assembly of Claim 1, wherein the intermediate shield comprises:

an outer intermediate shield; and

an inner intermediate shield disposed concentrically within the outer intermediate shield.

13. The containment assembly of Claim 12, wherein:

the outer intermediate shield is spaced apart from the outer shield to define a first intermediate space therebetween;

the inner intermediate shield is spaced apart from the outer intermediate shield to define a second intermediate space therebetween.

14. The containment assembly of Claim 13, further comprising:

a vibration damping material disposed within the first and second intermediate spaces.

15. The containment assembly of Claim 14, wherein the vibration damping material comprises sand.

16. The containment assembly of Claim 1, wherein the intermediate and inner shields are freely disposed within the outer shield.

17. The containment assembly of Claim 1, further comprising:

an inner support ring freely disposed within the outer shield cavity, the inner support ring having at least oppositely disposed first and second surfaces,

wherein the intermediate shield mount end is disposed on the inner support ring first surface.

18. The containment assembly of Claim 17, further comprising:

a support flange coupled to the inner shield outer surface proximate the inner shield mount end, the support flange extending away from the inner shield outer surface and at least partially disposed adjacent the inner support ring second surface.

19. The containment assembly of Claim 1, further comprising:

a lid mount flange coupled to the outer shield outer surface proximate the outer shield insertion end and extending away from the outer shield outer surface; and

a lid adapted to be coupled to the lid mount flange, the lid configured to cover at least a portion of each of the outer shield, intermediate shield, and inner shield insertion ends.

20. The containment assembly of Claim 19, wherein the lid is configured as a lid assembly that comprises:

a containment vessel lid coupled to lid mount flange, the containment vessel lid having in inner side facing at least the outer shield, an outer side, and an inner and outer peripheral side surfaces, the inner peripheral side surface defining an access opening therethrough; and

an access plate coupled to the containment lid and covering at least the access opening, the access plate having an inner side, an outer side, and an outer peripheral side surface.

21. The containment assembly of Claim 1, further comprising:

a vessel mount flange coupled to the outer shield outer surface proximate the outer shield mount end and extending away from the outer shield outer surface, the vessel mount flange adapted to couple the outer shield to a mount surface.

22. An energy storage flywheel system containment assembly, comprising:

an outer shield having a mount end, an insertion end, and an inner surface defining a cavity therein;

an intermediate shield freely disposed within the outer shield cavity, and having a mount end, an insertion end, and an inner surface defining a cavity therein;

an inner shield freely disposed within the intermediate shield cavity, and having a mount end, an insertion end, and an inner surface defining a cavity therein, the inner shield cavity having a first end that has a first width and a second end that has a second width that is less than the first width;

a lid adapted to be coupled to the outer shield insertion end, the lid configured to cover at least a portion of each of the outer shield, intermediate shield, and inner shield insertion ends,

wherein at least a portion of the inner shield extends inwardly into the inner shield cavity to form a momentum deflector rim, whereby the inner shield cavity second width is made less than the first width.

23. The containment assembly of Claim 22, wherein the lid is configured as a lid assembly that comprises:

a containment vessel lid coupled to outer shield insertion end, the containment vessel lid having in inner side facing at least the outer shield, an outer side, and an inner and outer peripheral side surfaces, the inner peripheral side surface defining an access opening through the containment vessel lid; and

an access plate coupled to the containment vessel lid and covering at least the access opening, the access plate having an inner side, an outer side, and an outer peripheral side surface.

24. The containment assembly of Claim 22, wherein the intermediate shield comprises:

an outer intermediate shield; and

an inner intermediate shield disposed concentrically within the outer intermediate shield.

25. The containment assembly of Claim 12, wherein:

the outer intermediate shield is spaced apart from the outer shield to define a first intermediate space therebetween;

the inner intermediate shield is spaced apart from the outer intermediate shield to define a second intermediate space therebetween.

26. The containment assembly of Claim 1, further comprising:

an inner support ring freely disposed within the outer shield cavity, the inner support ring having at least oppositely disposed first and second surfaces,

wherein the intermediate shield mount end is disposed on the inner support flange first surface.

27. The containment assembly of Claim 26, further comprising:

a support flange coupled to the inner shield outer surface proximate the inner shield mount end, the support flange extending away from the inner shield outer surface and at least partially disposed adjacent the inner support ring second surface.

28. The containment assembly of Claim 1, further comprising:

a lid mount flange coupled to the outer shield outer surface proximate the outer shield insertion end and extending away from the outer shield outer surface,

wherein the lid is coupled to the lid mount flange.

29. The containment assembly of Claim 22, further comprising:

a vessel mount flange coupled to the outer shield outer surface proximate the outer shield mount end and extending away from the outer shield outer surface, the vessel mount flange adapted to couple the outer shield to a mount surface.

30. An energy storage flywheel system containment assembly, comprising:

an outer shield having a mount end, an insertion end, and an inner surface defining a cavity therein;

an intermediate shield freely disposed within the outer shield cavity, and having a mount end, an insertion end, and an inner surface defining a cavity therein;

an inner shield freely disposed within the intermediate shield cavity, and having a mount end, an insertion end, and an inner surface defining a cavity therein, the inner shield cavity having a first end that has a first width and a second end that has a second width that is less than the first width;

a containment vessel lid coupled to the outer shield insertion end, the containment vessel lid having in inner side facing at least the outer shield, an outer side, and an inner and outer peripheral side surfaces, the inner peripheral side surface defining an access opening through the containment vessel lid; and

an access plate coupled to the containment vessel lid and covering at least the access opening, the access plate having an inner side, an outer side, and an outer peripheral side surface,

wherein at least a portion of the inner shield extends inwardly into the inner shield cavity to form a momentum deflector rim, whereby the inner shield cavity second width is made less than the first width.